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ARS 921 (2012) (English): Fresh onions -- Specification



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Fresh onions — Specification

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Foreword

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This African Standard was prepared by the ARSO Technical Harmonization Committee on Agriculture and Food Products (ARSO/THC 1).

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Introduction

The onion (*Allium cepa*), which is also known as the bulb onion, common onion is the most widely cultivated species of the genus *Allium*. The genus *Allium* also contains a number of other species variously referred to as onions and cultivated for food. Onion is most frequently a biennial, although it can also be a triennial or a perennial.

The vast majority of cultivars of *A. cepa* belong to the "common onion group" (*A. cepa* var. *cepa*) and are usually referred to simply as "onions". The Aggregatum Group of cultivars (*A. cepa* var. *aggregatum*) includes both shallots and potato onions.

Onions are often chopped and used as an ingredient in various hearty warm dishes, and may also be used as a main ingredient in their own right, for example in French onion soup or onion chutney. They are also used raw in cold salads. Onions are also used as a thickening agent for curries providing a bulk of the base. Onions pickled in vinegar are eaten as a snack. These are often served as a side serving in fish and chip and as pickled onions. Fresh onion has a pungent, persistent, even irritating taste, but when sautéed, onion becomes sweet and much less pungent.

Common onions are normally available in three colours: yellow, red, and white. Yellow onions, also called brown onions, are full-flavoured and are a reliable standby for cooking almost anything. Yellow onions turn a rich, dark brown when cooked and give French onion soup its tangy sweet flavour. The red onion is a good choice for fresh uses or in grilling and char-broiling. White onions are the traditional onion used in classic cuisines. They have a golden colour and sweet flavour when sautéed.

Onions may be grown from seed or, more commonly today, from sets started from seed the previous year. Onion sets are produced by sowing seed very thickly one year, resulting in stunted plants that produce very small bulbs. These bulbs are very easy to set out and grow into mature bulbs the following year, but they have the reputation of producing a less durable bulb than onions grown directly from seed and thinned.

Fresh onions — Specification

1 Scope

This standard applies to onions of varieties (cultivars) grown from *Allium cepa L.* to be supplied to the consumer in the natural state, green onions with full leaves and onions for industrial processing being excluded.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ARS 53, *General principles of food hygiene — Code of practice*

ARS 56, *Prepackaged foods — Labelling*

CAC/GL 21, *Principles for the establishment and application of microbiological criteria for foods*

CAC/RCP 44, *Recommended international code of practice for the packaging and transport of tropical fresh fruits and vegetables*

CAC/RCP 53, *Code of hygienic practice for fresh fruits and vegetables*

CODEX STAN 193, *Codex general standard for contaminants and toxins in food and feed*

ISO 874, *Fresh fruits and vegetables — Sampling*

ISO 2169, *Fruits and vegetables — Physical conditions in cold stores — Definitions and measurement*

ISO 6561-1, *Fruits, vegetables and derived products — Determination of cadmium content — Part 1: Method using graphite furnace atomic absorption spectrometry*

ISO 6561-2, *Fruits, vegetables and derived products — Determination of cadmium content — Part 2: Method using flame atomic absorption spectrometry*

ISO 6633, *Fruits, vegetables and derived products — Determination of lead content — Flameless atomic absorption spectrometric method*

ISO 6634, *Fruits, vegetables and derived products — Determination of arsenic content — Silver diethyldithiocarbamate spectrophotometric method*

ISO 6637, *Fruits, vegetables and derived products — Determination of mercury content — Flameless atomic absorption method*

ISO 7563, *Fresh fruits and vegetables — Vocabulary*

ISO 7952, *Fruits, vegetables and derived products — Determination of copper content — Method using flame atomic absorption spectrometry*

ISO 9526, *Fruits, vegetables and derived products — Determination of iron content by flame atomic absorption spectrometry*

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ISO 17239, *Fruits, vegetables and derived products — Determination of arsenic content — Method using hydride generation atomic absorption spectrometry*

3 Definitions

For the purposes of this standard, the terms and definitions in ISO 7563, and the following terms and definitions apply.

3.1

mature

well cured. Midseason onions which are not customarily held in storage shall be considered mature when harvested in accordance with good commercial practice at a stage which will not result in the onions becoming soft or spongy.

3.2

dormant

at least 90 per cent of the onions in any lot show no evidence of growth as indicated by distinct elongation of the growing point or distinct yellow or green colour in the tip of the growing point

3.3

fairly firm

the onion may yield slightly to moderate pressure but is not appreciably soft or spongy

3.4

fairly well shaped

having the shape characteristic of the variety, but onions may be slightly off-type or slightly misshapen

3.5

wet sunscald

sunscald which is soft, mushy, sticky or wet

3.6

doubles

onions which have developed more than one distinct bulb joined only at the base

3.7

bottlenecks

onions which have abnormally thick necks with only fairly well developed bulbs

3.8

scallions

onions which have thick necks and relatively small and poorly developed bulbs

3.9

damage

any specific defect described in this section; or any equally objectionable variation of any one of these defects, any other defect, or any combination of defects, which materially detracts from the appearance, or the edible or marketing quality of the onions. The following specific defects shall be considered as damage:

- (a) Seedstems which are tough or woody, or which are more than 6.35 mm in diameter;
- (b) Splits when onions with two or more hearts are not practically covered by one or more outer scales;
- (c) Tops when more than 30 per cent of the onions in a lot have tops 76 mm or more in length;
- (d) New roots when most roots on an individual onion have grown to a length of 50 mm or more in length;

- (e) Dry roots when more than 20 percent of the onions in a lot have practically all roots 50 mm or more in length;
- (f) Dry sunken areas when the affected areas exceed the equivalent to that of a circle 12.7 mm in diameter on an onion 70 mm in diameter which does not have the outer papery scale covering the affected areas or when the affected areas exceed the equivalent to that of a circle 19 mm in diameter on an onion 70 mm in diameter which has the outer papery scale covering the affected areas. Correspondingly lesser or greater areas are allowed on smaller or larger onions;
- (g) Sunburn when more than 33 % of the onions in a lot have a medium green color on one-third of the surface;
- (h) Sprouts when visible, or when concealed within the dry top and more than 19 mm in length on an onion 5 cm or larger in diameter, or proportionately shorter on smaller onions;
- (i) Peeling when more than one-half of the thin papery skin is missing, leaving the underlying fleshy scale unprotected;
- (j) Cracked fleshy scales when one or more of the fleshy scales are cracked;
- (k) Watery scales when more than the equivalent of the entire outer fleshy scale is affected by an off-colour, watersoaked condition. The off-colour must be of some shade of brown or yellow;
- (l) Dirt, staining or other foreign matter when more than 20 % of the onions in a yellow, brown or red lot, or more than 15 % of the onions in a white lot are appreciably stained. Onions with adhering dirt or other foreign matter shall be judged on the same basis as stained onions;
- (m) Mechanical when any cut extends deeper than one fleshy scale, or when any bruise breaks a fleshy scale; and,
- (n) Translucent scales when more than the equivalent of two entire outer fleshy scales have a watersoaked condition.

3.10**diameter**

the greatest dimension measured at right angles to a straight line running from the stem to the root

3.11**badly misshapen**

the onion is so misshapen that its appearance is seriously affected

3.12**serious damage**

any specific defect described in this section; or any equally objectionable variation of any one of these defects, any other defect, or any combination of defects, which seriously detracts from the appearance, or the edible or marketing quality of the onions. The following specific defects shall be considered as serious damage:

- (a) Watery scales when more than the equivalent of two entire outer fleshy scales are affected by an off-coloured, watersoaked condition. The off-colour must be of some shade of brown or yellow;
- (b) Dirt, staining or other foreign matter when more than 25 per cent of the onions in a lot are badly stained. Onions with adhering dirt or other foreign matter shall be judged on the same basis as stained onions;
- (c) Seedstems when more than 12.7 mm in diameter;
- (d) Sprouts when the visible length is more than 12.7 mm;

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- (e) Mechanical when any cut extends deeper than two fleshy scales, or when cuts seriously damage the appearance of the onion; and,
- (f) Dry sunken areas when extending deeper than one fleshy scale, or when affecting an area equivalent to that of a circle 25 mm in diameter on an onion 70 mm in diameter, or correspondingly lesser or greater areas on smaller or larger onions.

3.13

one type

the onions are within the same general colour category

4 Provisions concerning quality

4.1 General

The purpose of the standard is to define the quality requirements of onions at the export control stage, after preparation and packaging.

4.2 Minimum requirements

4.2.1 In all classes, subject to the special provisions for each class and the tolerances allowed, the bulbs must be:

- (a) intact;
- (b) sound; produce affected by rotting or deterioration such as to make it unfit for consumption is excluded
- (c) clean, practically free of any visible foreign matter
- (d) free from damage due to frost
- (e) sufficiently dry for the intended use (in the case of pickling onions, at least the first two outer skins and the stem must be fully dried)
- (f) without hollow or tough stems
- (g) practically free from pests
- (h) practically free from damages caused by pests
- (i) free of abnormal external moisture
- (j) free of any foreign smell and/or taste.

In addition the stems must be twisted or clean cut and must not exceed 6 cm in length (except for stringed onions).

4.2.2 The development and condition of the onions must be such as to enable them:

- (a) to withstand transport and handling, and
- (b) to arrive in satisfactory condition at the place of destination.

4.3 Classification

The onions are classified in two classes defined below:

4.3.1 Class I

Onions in this class must be of good quality. Their characteristics must be typical of the variety.

The bulbs must be:

- firm and compact
- unsprouted (free from externally visible shoots)
- free from swelling caused by abnormal vegetative development
- practically free of root tufts; however, for onions harvested before complete maturity, root tufts are allowed.

The following defects, however, may be allowed, provided they do not affect the general appearance of the produce, the quality, the keeping quality or presentation in the package:

- a slight defect in shape
- a slight defect in colouring
- light staining which does not affect the last dried skin protecting the flesh, provided it does not cover more than one fifth of the bulb's surface
- superficial cracks in, and partial absence of the outer skins, provided the flesh is protected.

4.3.2 Class II

This class includes onions which do not qualify for inclusion in Class I, but satisfy the minimum requirements specified above. They must be reasonably firm.

The following defects may be allowed provided the onions retain their essential characteristics as regards the quality, the keeping quality and presentation:

- defect in shape
- defect in colouring
- early evidence of externally visible shoot growth (no more than 10 per cent by number or weight by unit of presentation)
- traces due to rubbing
- slight marking caused by parasites or disease
- small healed cracks
- slight bruising, healed, unlikely to impair keeping qualities
- root tufts
- stains which do not affect the last dried skin protecting the flesh, provided they do not cover more than half the bulb's surface
- cracks in the outer skins and partial absence of over a maximum of one third of the bulb's surface, provided the flesh is not damaged.

5 Provisions concerning sizing

Size is determined by the maximum diameter of the equatorial section. The difference between the diameters of the smallest and largest onions in the same package must not exceed:

- 5 mm where the diameter of the smallest onion is 10 mm and over but under 20 mm. However, where the diameter of the onion is 15 mm and over but under 25 mm, the difference may be 10 mm
- 15 mm where the diameter of the smallest onion is 20 mm and over but under 40 mm
- 20 mm where the diameter of the smallest onion is 40 mm and over but under 70 mm
- 30 mm where the diameter of the smallest onion is 70 mm or over.

The minimum diameter is fixed at 10 mm.

6 Provisions concerning tolerances

Tolerances in respect of quality and size shall be allowed in each package (or in each batch, for onions in bulk) for produce not satisfying the requirements of the class indicated.

6.1 Quality tolerances

6.1.1 Class I

10 per cent by number or weight of onions not satisfying the requirements of this class, but meeting those of Class II or, exceptionally, coming within the tolerances of that class.

6.1.2 Class II

10 per cent by number or weight of onions satisfying neither the requirements of the class nor the minimum requirements with the exception of produce affected by rotting or any other deterioration rendering it unfit for consumption.

6.2 Size tolerances

For all classes: 10 per cent by number or weight of onions not satisfying the size identified, but with a diameter of no more than 20 per cent below or above it.

7 Provisions concerning presentation

7.1 Uniformity

The contents of each package (or lot, for produce presented in bulk) must be uniform and contain only onions of the same origin, variety, quality and size.

However, sales packages, of a net weight not exceeding three kilogrammes, may contain mixtures of onions of different colours, provided that they are uniform in quality, and, for each colour concerned, in origin, variety and size.

The visible part of the contents of the package (or lot, for produce presented in bulk) must be representative of the entire contents.

7.2 Packaging

Onions must be packed in such a way as to protect the produce properly.

The materials used inside the package must be new, clean and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, and in particular of paper or

stamps bearing trade specifications is allowed, provided the printing or labelling is done with non-toxic ink or glue.

Stickers individually affixed on the produce shall be such that, when removed, neither leave visible traces of glue, nor lead to skin defects.

Packages must be free of all foreign matter.

7.3 Presentation

Onions may be presented:

- arranged in layers
- loose in a package (including bulk bins)
- transported in bulk
- in strings
- either of a certain number of bulbs, in which case the strings must contain at least six onions (with fully dried stems)
- or of a certain net weight.

For stringed onions, the characteristics of the strings in any one package (number of bulbs or net weight) must be uniform.

8 Marking and labelling

8.1 Consumer packages

In addition to the requirements of ARS 56, the following specific provisions apply:

8.1.1 Nature of produce

If the produce is not visible from the outside, each package shall be labelled as to the name of the produce and may be labelled as to name of the variety and/or commercial type.

8.2 Non-retail containers

Each package¹ must bear the following particulars in letters grouped on the same side, legibly and indelibly marked, and visible from the outside:

For onions transported in bulk (direct loading into a transport vehicle) these particulars must appear on a document accompanying the goods, and attached in a visible position inside the transport vehicle.

8.2.1 Identification

The exporter, packer and/or dispatcher shall be identified by name and physical address (e.g. street/city/region/postal code and, if different from the country of origin, the country) or a code mark officially recognized by the national authority.²

¹ Package units of produce prepacked for direct sale to the consumer shall not be subject to these marking provisions but shall conform to the national requirements. However, the markings referred to shall in any event be shown on the transport packaging containing such package units.

² The national legislation of a number of countries requires the explicit declaration of the name and address. However, in the case where a code mark is used, the reference "packer and/or dispatcher (or equivalent abbreviations)" has to be indicated in close connection with the code mark, and the code mark should be preceded by the ISO 3166 (alpha) country/area code of the recognizing country, if not the country of origin.

8.2.2 Nature of produce

- "Onions" if the contents are not visible from the outside.
- In the case of sales packages containing a mixture of different colours of onions:
- 'Mixed onions' or equivalent denomination,
- If the contents are not visible from the outside, the indication of each of the colours present in the package and of the minimum number of pieces of each of the colours concerned.

8.2.3 Origin of produce

- Country of origin and, optionally, national, regional or local place name.
- In the case of sales packages containing a mixture of onions of different colours and different origins, the indication of each country of origin shall appear next to the name of the colour concerned.

8.2.4 Commercial specifications

- Class
- Size expressed by minimum and maximum diameters
- Net weight.

8.2.5 Official control mark (optional)

9 Contaminants

9.1 Pesticide residues

Onions shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

9.2 Heavy metals

Onions shall comply with those maximum levels for heavy metals established by the Codex Alimentarius Commission for this commodity. The current limits are as indicated below:

Metal	Unit of measurement	Maximum limit	Test method
Lead (Pb)	mg/kg wet weight	0.10	ISO 6633 (AAS)
Cadmium (Cd)	mg/kg wet weight	0.050	ISO 6561-1 or 6561-2

10 Hygiene

10.1 It is recommended that the produce covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of ARS 53, CAC/RCP 53, and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.

10.2 The produce should comply with any microbiological criteria established in accordance with CAC/GL 21.



Red onions

Seeding onions



Yellow onions



Spring onions



Green onions

Onion farm



Yellow, white and red onions

White onion



Chinese onions

Green onions seeding



Chinese onions seeding

Green onions

Annex A
(informative)

Guide to cold storage

A.1 Scope

This annex gives recommendations for the storage, with or without the use of artificial refrigeration, of onions intended for long-term conservation and consumption in the fresh state.

A.2 Limits of application

This annex provides guidance of a very general nature only. Because of the variability of the product according to the time and place of cultivation, local conditions may make it necessary to define other conditions for harvesting or other physical conditions in the store.

This annex does not apply unreservedly, therefore, to all cultivars in all climates, and it will remain for each specialist to be the judge of any modifications to be made.

Moreover, this annex does not take into account the role played by ecological factors, and wastage during storage is not dealt with.

Subject to the restrictions arising from the fact that onions are living material, the application of the guidelines contained in this annex should enable much wastage in storage to be avoided and thus should enable long-term storage to be achieved in most cases.

A.3 Conditions of harvesting and putting into store

A.3.1 Cultivars

It is necessary to choose onions of cultivars recognized as being well suited for keeping.

NOTE 1 Onions of late cultivars are generally chosen.

A.3.2 Harvesting

The onions should be harvested when 65 % to 75 % of the green leaves have turned yellow, the necks have become soft and the leaves are drooping, and the bulbs are covered with well differentiated outer scales signifying that they are in a state of physiological rest.

The onions should be harvested in such a way that they are neither bruised or otherwise damaged. The stem should be cut so that it does not exceed 4 cm after drying (see A.3.4)

A.3.3 Quality characteristics

Quantitative inspection of onions for conservation is strongly recommended.

It is necessary to choose onion bulbs of good quality, meeting the following requirements: sound, free from mechanical injuries, well covered by outer scales, well dried, ripe and homogeneous.

The onions should be free from foreign odour.

Bulbs having floral stems, or which are not covered by outer scales, which are double, triple, too large, too small, deformed, or not fully mature, should not be stored.

A.3.4 Various treatments before storage

To avoid sprouting, approved phytosanitary inhibitors may be applied if their use is not restricted.

Before storage, the onions should be dried to eliminate excess external moisture and moisture in the outer scales, the rootlets and the neck.

If natural drying is not possible, a suitable method of artificial drying should be used, for example exposure to a current of warm dry air for a period of 4 days up to a maximum of 8 days, depending on the moisture content. The air temperature may be up to a maximum of 30°C and the relative humidity should, if possible, be from 60 % to 70 %. The rate of air flow may be from 2 m³/min to 2.5 m³/min per cubic metre of bulbs. Ventilation should be effected either with fresh air from outside the store or with a mixture of outside and inside air, with different rates of air change for the two different types of ventilation. Alternatively, the internal air may simply be recirculated in closed circuit, in which case the recommended air circulation ratio is from 40 to 50 per hour.

Drying has been achieved when the moisture content of the outer scales reaches 12 % to 14 %. At this moisture content, bulbs rustle when handled.

To avoid risk of damage to the onions in transport, it is recommended that drying be carried out at the storage site, in a room specially equipped to carry out this treatment.

Artificial drying should be carried out directly after harvesting, while the onions are in a state of physiological rest, because subsequent treatment with warm air (up to 30 °C) promotes sprouting.

A.3.5 Putting into store

Stores for keeping onions should be refrigerated or provided with an air-ventilation system with distribution of air through the floor, and should be perfectly dry, clean and disinfected. Filling of stores should be carried out quickly, without exceeding a period of 7 days to 8 days

It is necessary to avoid storage of onions with other vegetables or fruits to which their particular taste and odour may be transmitted. Storage of onions and garlic in the same store is, however, permissible.

The onions should be put into store as soon as possible after drying, if this has not been carried out in the store. In the case of storage in bulk, if the onions are not completely dry it is necessary to start ventilation immediately, without waiting for the store to be completely filled.

A.3.6 Method of storage

The onions may be stored in bulk, in packages on pallets, in box pallets, in crates, in sacks or in containers. Onions packed in sacks may be stored for only a short period of time.

In the case of storage in bulk, the maximum storage level should be of the order of

- a) 2 m to 2.5 m, for storehouses with natural ventilation, and
- b) 3.5 m to 4.5 m, for storehouses with forced ventilation,

the exact level being dependent on the resistance of the bulbs to crushing.

To avoid damage, packages should be stacked 5 to 7 tiers high, and a gap of 15 cm to 20 cm in the proximity of the side walls and of 5 cm to 8 cm between the stacks of packages should be provided to ensure the free circulation of air.

A.4 Optimum storage conditions"

A.4.1 General

For the conservation of onions, the temperature and humidity conditions are varied according to

- a) the technological phase of conservation:

- b) the specificity of the cultivar;
- c) the storage system;
- d) the storehouse itself, i.e., whether it possesses an ambient-air ventilation system or uses artificial refrigeration.

The temperature and moisture conditions should be maintained constant throughout the storage period. The maximum allowable variations in temperature and relative humidity are +1 °C and +5 % respectively.

Conservation factors should be controlled every day quality control of onions should be carried out every 7 days to 10 days to verify the phytosanitary and behavioural state of the product.

A.4.2 Temperature

A.4.2.1 Optimum temperature

Long-term storage of onions may be achieved at various temperatures according to the storage system used and the resistance of the cultivar to low temperatures, as follows:

- a) storage at ambient temperature in stores without artificial refrigeration (with natural or forced ventilation)
- b) storage at a temperature of $0^{\circ}\text{C} \pm 1^{\circ}\text{C}$ for cultivars with moderate resistance to cold.
- c) storage at a temperature of 1°C to -2.5°C (i.e., the onions are almost frozen) for cultivars with good resistance to cold

A.4.2.2 Control of temperature conditions

A.4.2.2.1 Control using cold ambient air

Air from outside the storehouse may be introduced whenever the temperature outside is less than that inside.

To avoid the risk of frost damage to the onions, air having a temperature of less than -3°C shall not be introduced into the storehouse. The ventilation and insulation system should be such that the required temperature may be maintained for as long as outside conditions are favourable.

A.4.2.2.2 Control using artificial refrigeration

In this case, air circulation takes place in a closed circuit. It is recommended that the air be renewed at regular intervals throughout the storage period.

A.4.3 Relative humidity

To help prevent the development of mould and the appearance of roots, a constant relative humidity of 70% to 75% is recommended.

A.4.4 Air circulation

To obtain constant temperature and relative humidity, it is necessary to set very strict requirements for the air-circulation system. Two different types of air circulation may be distinguished.

A.4.4.1 Closed-circuit circulation

The objective of this type of circulation is to promote cooling of the onions to maintain their temperature uniform, and to remove from the packages gases and volatile compounds resulting from

the metabolic processes of the onions.

An air-circulation ratio of 20 to 30 per hour is recommended both for systems using cold ambient air and for systems using artificial refrigeration.

A.4.4.2 Air renewal

The high density storage of onions produces an accumulation of carbon dioxide due to the respiration of the onions. It is necessary to eliminate this by introducing fresh air at regular intervals throughout the storage period. The air-circulation system should provide a rate of air change of 20 to 30 per hour.

A.4.5 Storage life

When using cooling with ambient air, the storage life may vary from 3 months to 7 months according to the cultivar and the climatic conditions in the country or region in which the onions are stored. When using artificial refrigeration, the expected storage life may be up to 9 months.

A.4.6 Operations during and at the end of storage

The onions should not be handled if they exhibit crystals of ice. Precautions should also be taken to avoid any risk of freezing of supercooled onions during handling.

To avoid all traces of moisture on the surface of the bulbs, when the onions are taken out of storage, it is recommended that the onions are kept for approximately 24 h at an intermediate temperature. Then conditioning and packaging of onions for delivery may proceed.

A.5 Other conservation processes

Chemical sprouting inhibitors may be used in countries where their use is not restricted. In the case of onions destined for export after storage, account should be taken of the restrictions on the use of chemical inhibitors in force in the importing country.

Interesting results have also been obtained with the use of ionizing radiation of the order of 6 000 rad to 10000 rad. This conservation technique is, however, subject to restrictions in certain countries.

A.6 Summary of recommended storage conditions

The technological phases and their duration, and the corresponding conditions that should be effected are indicated in Table A.1.

Table A.1 — Summary of storage conditions for onions

Technological phase		Duration days	Temperature °C	Relative humidity, max %	Ventilation rate h/day
Drying		4 to 8	External air or warm air (30 max.)	70	18 to 20
Cooling		10 to 14	+2 to -2	75	16 to 20
Storage	Under ambient conditions	90 to 210	Ambient air (-3 min.)	75	6 to 8
	Under artificial refrigeration	180 to 270	-1 to +1 ¹⁾ -1 to -2.5 ²⁾	75	6 to 8

¹⁾ For the cultivars having a moderate resistance to cold
²⁾ For cultivars having a good resistance to cold

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